

L&W Freeness and Fiber Online

Lorentzen & Wettre Products | Pulp measurements



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L&W Freeness
and Fiber Online
(cabinet)

L&W Freeness and Fiber Online combines the measurements of freeness and fiber properties. Giving the complete story of dewatering status and fiber quality in real time. Enabling customers to easily pinpoint and follow trends on furnish quality and at the same time reducing variations in stock preparation or pulp production. L&W Freeness and Fiber Online measures Canadian Standard Freeness (CSF) or Schopper-Riegler (SR) for full control of the refining process. As well as significant fiber variables in paper stock preparation and pulp production. Measuring fiber properties solves the problem of detecting quality issues caused by fiber variations too late in the production process. By discovering variations as early as in stock preparation, it is possible to take corrective actions to produce paper, board or tissue that meets production specification. Well-proven pulp samplers connected to the process automatically take samples of pulp before and after refiners to ensure that the target set point value is being met. Fast response to process variations helps pulp and paper makers save production costs by optimizing fiber usage and eliminating over-refining. L&W Freeness and Fiber Online can be connected with up to eight samplers and can handle a process consistency of up to 8%.

L&W Freeness and Fiber Online is a reliable online system for measuring, monitoring and controlling freeness and key fiber properties in pulp processing. It helps to create the best possible continuous and uniform pulp furnish for the paper, board or tissue machine.

Features / Benefits

- Energy savings from refiner optimization
- Uniform furnish minimizes web breaks
- Optimize machine speed by optimizing freeness set point
- Easy to control grade changes
- Few moving parts and easy to maintain
- Robust unit that is easy to place close to refiners
- Monitor fines and fibrils to see when it is time to change refiner plates
- Evaluation of new refiners plates with both freeness and fibril index
- Fibril index tells the complete story about tensile strength that CSF and SR sometimes oversees
- Optimize use and selection of incoming pulp
- Control and optimize furnish mix to the paper machine
- Fast and accurate measurement

Easy to place and maintain

L&W Freeness and Fiber Online is designed to be robust and reliable. The electronic cabinet is IP65 classified, this high IP-classification makes it possible to place the unit close to the refiners or the production lines. It is designed to work well in demanding process environments. L&W Freeness and Fiber Online has a touch screen, integrated water

hose, electronics separated from the measurement chamber and camera, and all components are easily accessible from the front, all to ensure high uptime and a minimum maintenance need. Fully automated sampling and measurement cycle which gives multiple pulp quality parameters.

According to standards

The measurements of CSF and SR in L&W Freeness and Fiber Online relate to TAPPI (T-227) and ISO (5267-1 and 5267-2) standards in the following ways:

- Diluted to correct consistency (0.3% or 0.2% depending on standard)
- Screen plate identical to standard
- 1 liter sample is analyzed
- Compensation for consistency and temperature
- Water measurement between samples
- Double measurement set-up

Fiber properties are measured according to international standards (ISO 16065-2); it is based on ABB's well-known L&W Fiber Tester Plus, a laboratory instrument that is used by hundreds of papermakers to track their pulp quality and is a preferred tool by research centers and universities around the world.

Measurement principle

ABB's well proven sampler automatically takes a representative sample from the process pipe. The sample is pushed to the freeness dilution tank, where the sample is diluted to approximately 0.3% for CSF or 0.2% for SR. To reduce analyzing time, the next sample is pushed forward and is held in its pipe until the sample before it is finished. The first sample is then transported to the freeness measurement chamber and a small part of the diluted sample is transferred to the fiber dilution tank.

In the freeness measurement chamber a pulp pad is created over the screen as it dewateres. The dewatering rate is measured with an ultrasonic sensor. The second sample is then moved to the dilution tank. Mathematical operations are made to calculate the corresponding CSF or SR value. The result is compensated with the correct consistency from the optical sensor and the temperature is measured and compensated for as well, according to standards.

The pulp pad is cleaned out from the freeness chamber by air and water to create turbulence; then it is flushed to drainage. The second sample is transported to the freeness chamber for measurement.

The sample that is transferred to the fiber dilution tank is diluted further. The pulp sample is then passed through a measuring cell where the fibers are detected by the camera. A two-dimensional image technology is used, with a very small measurement gap (according to ISO standard)

ensures a good alignment of the fibers. After the chosen number of fibers have been detected by the camera, the fiber system is flushed and cleaned with water, to minimize residual fibers between measurements.

Learn more

For decades, as leading supplier of fiber testers and freeness laboratory measurements, we have the knowledge, products and experience to help our customers achieve their measurement objectives. Please contact us to learn more about how our products can help optimize your production.

Measured properties

Fibre length – Fibre length is an important property of pulp, and longer fibres generally improve the strength properties up to a certain point. Very long fibres are more easily entangled with each other, giving the sheet poor formation. L&W Freeness and Fiber Online is designed to measure true fibre length.

Fibre width – Thinner fibres, if all other dimensions are constant, provide a better and more even formation in the sheet. The fibre width decreases when lignin is removed. A low fibre width will give a sheet a more even surface. In L&W Freeness and Fiber Online the calculation principle allows for detection of variations of parts of μm .

Shape factor – (also called form factor) is an important measure of pulp quality. Shape factor is defined as the ratio of the maximum extension length of the fibre to the true length of the fibre. A high shape factor means straight fibres and gives in most cases good mechanical properties in the sheet. It is well correlated with tensile strength and tensile stiffness. A gently treated laboratory pulp has quite straight fibres, whereas there are several process stages in a mill that are potential curlers of fibres, like presses, mixers etc.

Fibril area and perimeter – Two fibrillation indexes (fibril area and fibril perimeter) are calculated based on area and perimeter respectively. Fibre bonds, which are considered to consist of hydrogen bonds, are rather weak. To increase the bonding strength the fibres are refined where the fibre surface is roughened (fibrillated) creating a larger contact area for bonding between the fibres. It is also a useful index of the amount of mechanical treatment given to the pulp.

Fines – Two classes of fines are regarded, P and S. A coarse fines class (P) and a fines class (S) are reported. Fines often have a different impact on processes and products than the fibres. Before treatment (i.e. beating) only P fines are present and ray cells are included in this classification. P fines have poor bonding properties. S fines are created during beating and they may improve the strength of the sheet. Fines have a negative effect on dewatering and pressing. .

CSF – Canadian Standard Freeness measures the rate at which a dilute suspension of pulp may be dewatered. The drainage rate has been shown to relate to the surface conditions and swelling of the fibers. It is a commonly used index to measure the amount of mechanical treatment given to the pulp.

SR – Schopper-Riegler is another method for measuring the rate at which a dilute suspension of pulp may be dewatered. The SR method is intended for long fibred pulps. It is a commonly used index to measure the amount of mechanical treatment given to the pulp.

Technical specifications	
- L&W Freeness and Fiber Online, code 951	
Inclusive	L&W Freeness and Fiber Online, touch screen and Vortex cooler
Measurement	
Measurement frequency	4–7 minutes/sample
Number of samplers	1–8 samplers
Measurement Freeness	
Screen plate	97 holes per cm ² hole diameter 0.5 mm (0.02 in)
Measuring range	CSF: 700–20 ml SR: 10–90 SR°
Consistency	Controlled and adjusted to 0.2% or 0.3%
Temperature	Compensating for temperatures differing from 20°C (68°F)
Measurement Fiber	
Technical details	Monitoring of fibres during measurement. Sample amount typically 0.1 g dry weight pulp, not critical
Measurement results	<ul style="list-style-type: none"> - Weighted averages for length, width, fibril area, fibril perimeter, shape factor and two classes of fines (S and P) are reported. - Number of measured fibres - Number of fibres in sample - Optional measurements: blend, vessel and kink
Measurement range	<ul style="list-style-type: none"> - Length according to ISO and Tappi standards (ISO: 0.2–7.5mm, Tappi: 0.1–7.5mm) - Width from 4 µm. - Resolution within measurement range is 0.1 µm for an average SW fibre - Shape factor (O) 50–100% - Fines l < 0.2 mm or l < 0.1 mm depending on used standard for length
Repeatability	Length 1.5 %, width 1 % and shape 0.5 % of average
Sample types	- Separate sample types can be declared for different sampling points or by different users.
Installation requirements	
Power	100–120V or 200–240V
Water	Filtered to 25µ or better with sufficient flow rate
Water pressure	0.3–0.8 MPa (3–8 bars)
Water temperature	20 ±10°C
Water consumption	<p>Average water consumption for freeness measurements: 146 L/min (4937 fl oz US/h)</p> <p>Average water consumption for fiber measurements: approx. 150 l/h 10–15 samples á 10 l (5072 fl oz US/h, 10–15 samples á 2.64 US)</p>
Instrument air	Air supply shall follow standard ISO 8573-1 Air class 2-4-3
Air pressure	0.55–0.7 MPa (80–102 psi)
Hoses for samplers	<p>Air: Ø6 mm (1/4 in) water resistant polyurethane ether (PU) or polyamide (PA)</p> <p>Water: Ø10 mm (3/8 in) water resistant polyurethane ether (PU) or polyamide (PA)</p>
Sample transportation:	Ø15 mm (19/32 in) water resistant polyurethane ether (PU) or polyamide (PA)
Cables for samplers	5 × 0.38 mm ²
Enclosure class	Safety and water protection IP65
Connections	
Data output	4–20 mA OPC UA (optional)

Sampling	
Recommended no. of sampling points	2–8 (Possible to add more samplers)
Pulp consistency in pipe	max. 8%
Min. pressure in pipe	with: consistency 1–3%: 1 bar consistency 3–5%: 1,5 bar consistency 5–8%: 2.5 bar
Distance between sampling point and cabinet	max. 100 m
Options	
	OPC UA Blend Objects (vessels and shives)
Dimensions	
L&W Freeness and Fiber Online	2070 × 1750 × 500 mm (81.4 × 69.9 × 9.7 in)
Sampler	400 × 340 × 310 mm (15.7 × 13.4 × 12.2 in)
Net weight	
L&W Freeness and Fiber Online	320kg (706 lb)
Sampler	4 kg (8.8 lb)
Applicable standards	
ISO 5267-2, ISO 5267-1, ISO 16065-2, and TAPPI T227	



L&W Freeness and Fiber Online illustrated with example of connected samplers.

Inside L&W Freeness and Fiber Online

